

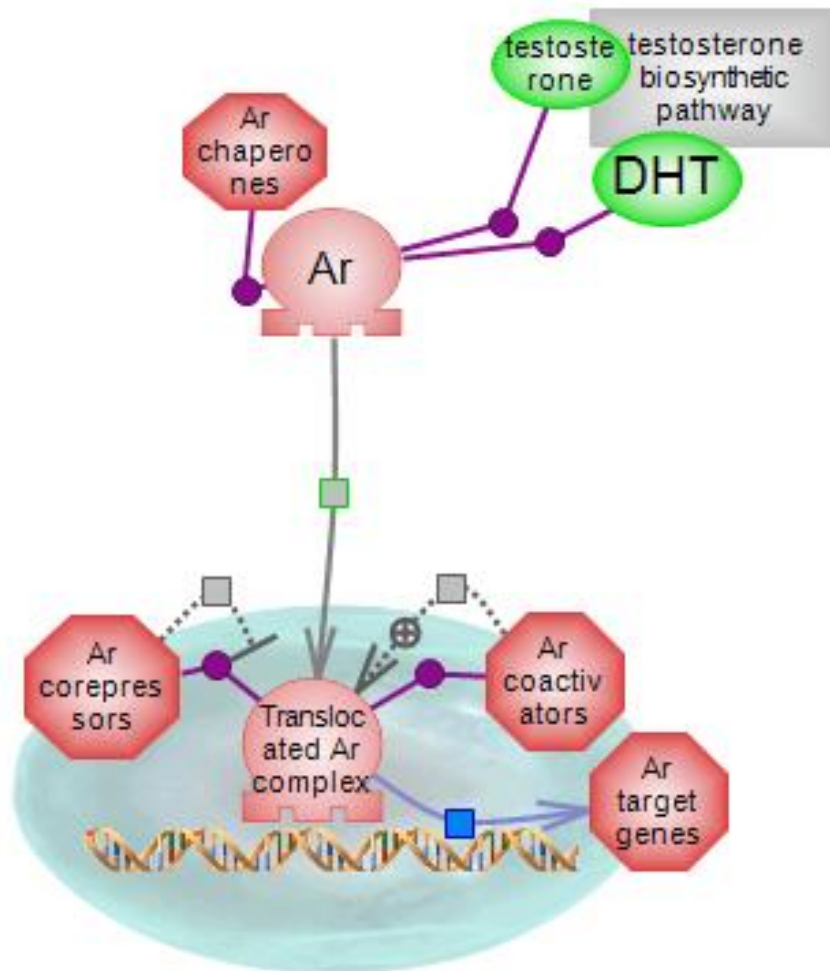
Cell Communication & Signaling Research

Webpage: <http://rgd.mcw.edu/wg/home/pathway2/molecular-pathways2>

Scroll down to the section on “Signaling Pathway”

You will analyze 5 common signaling pathways listed below. I have added the images of each signaling pathway to this document for easier analysis during this activity. Be sure to read through the information on each pathway while reviewing the diagram to alleviate confusion. Click on pathway components for information about them. If you come across any confusing terminology, be sure to search it out online for better understanding. Answer all questions for each pathway.

A. ANDROGEN SIGNALING PATHWAY



1. Which of the following correctly describes this pathway? **Explain your response below**
- a. Cytoplasmic receptor, Transduction Pathway, Metabolic Response
 - b. Cytoplasmic receptor, Nuclear Translocation, Nuclear Response
 - c. Membrane receptor, Nuclear Translocation, Nuclear Response
 - d. Membrane receptor, Nuclear Translocation, Nuclear Response

2. What is/are the ligand(s) of this pathway?

3. Explain why the receptor for this pathway can be found where it is based on the chemical nature of the ligand.

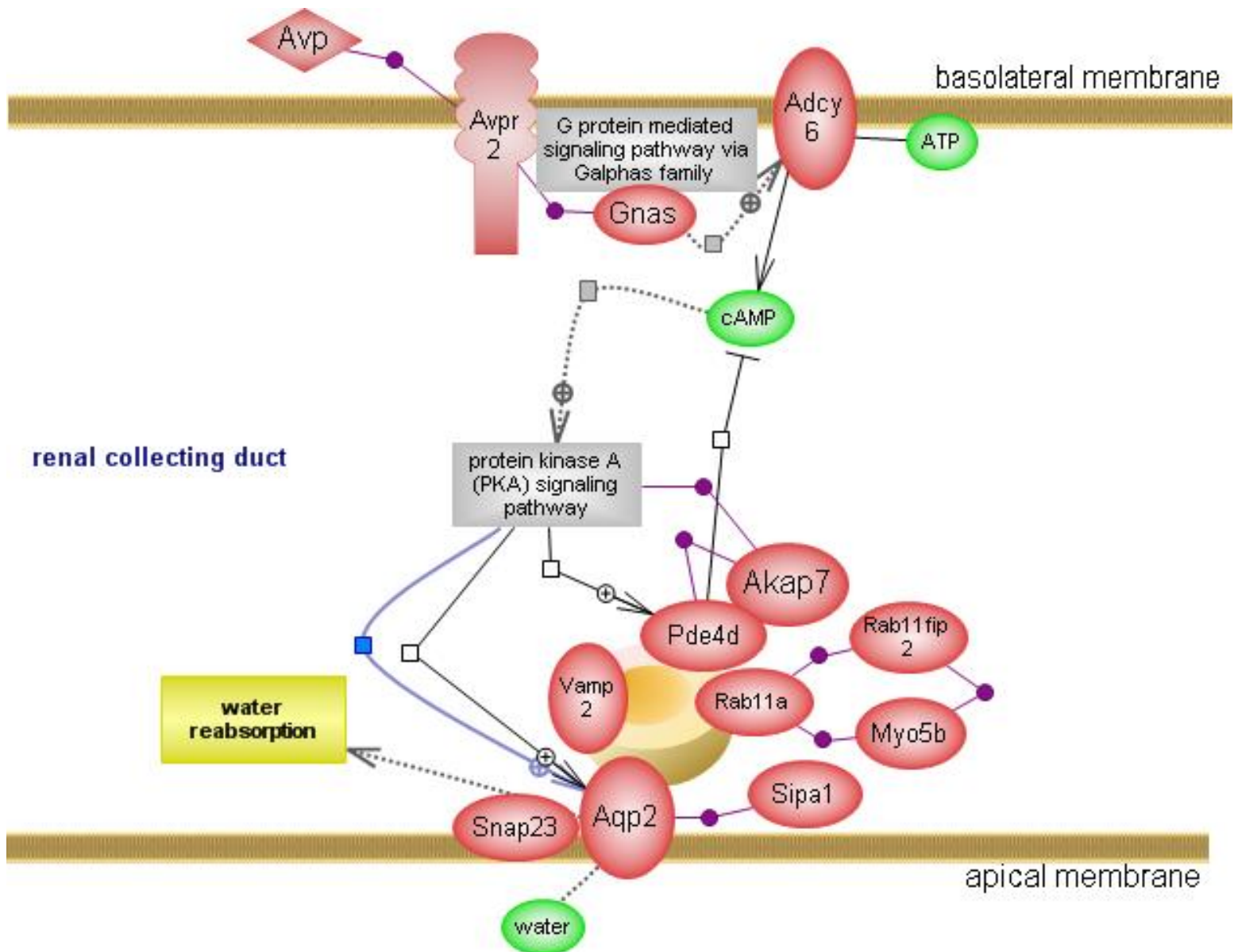
4. What chromosome is this receptor gene found on in HUMANS?

5. How many different chromosomes play a role in this pathway in HUMANS?

6. Describe 2 mechanisms by which this pathway could be disrupted using specific molecule examples.

7. Identify 1 other signaling pathway that follows a similar pathway.

B. VASOPRESSIN SIGNALING PATHWAY VIA RECEPTOR TYPE 2



- Which of the following correctly describes this pathway? **Explain your response below**
 - Cytoplasmic receptor, Transduction Pathway, Metabolic Response
 - Cytoplasmic receptor, Nuclear Translocation, Nuclear Response
 - Membrane receptor, Transduction Pathway, Metabolic Response
 - Membrane receptor, Nuclear Translocation, Nuclear Response

2. What is the overall outcome (cell process) of the vasopressin pathway? What is the name for this ligand you learned in the hormone assignment?

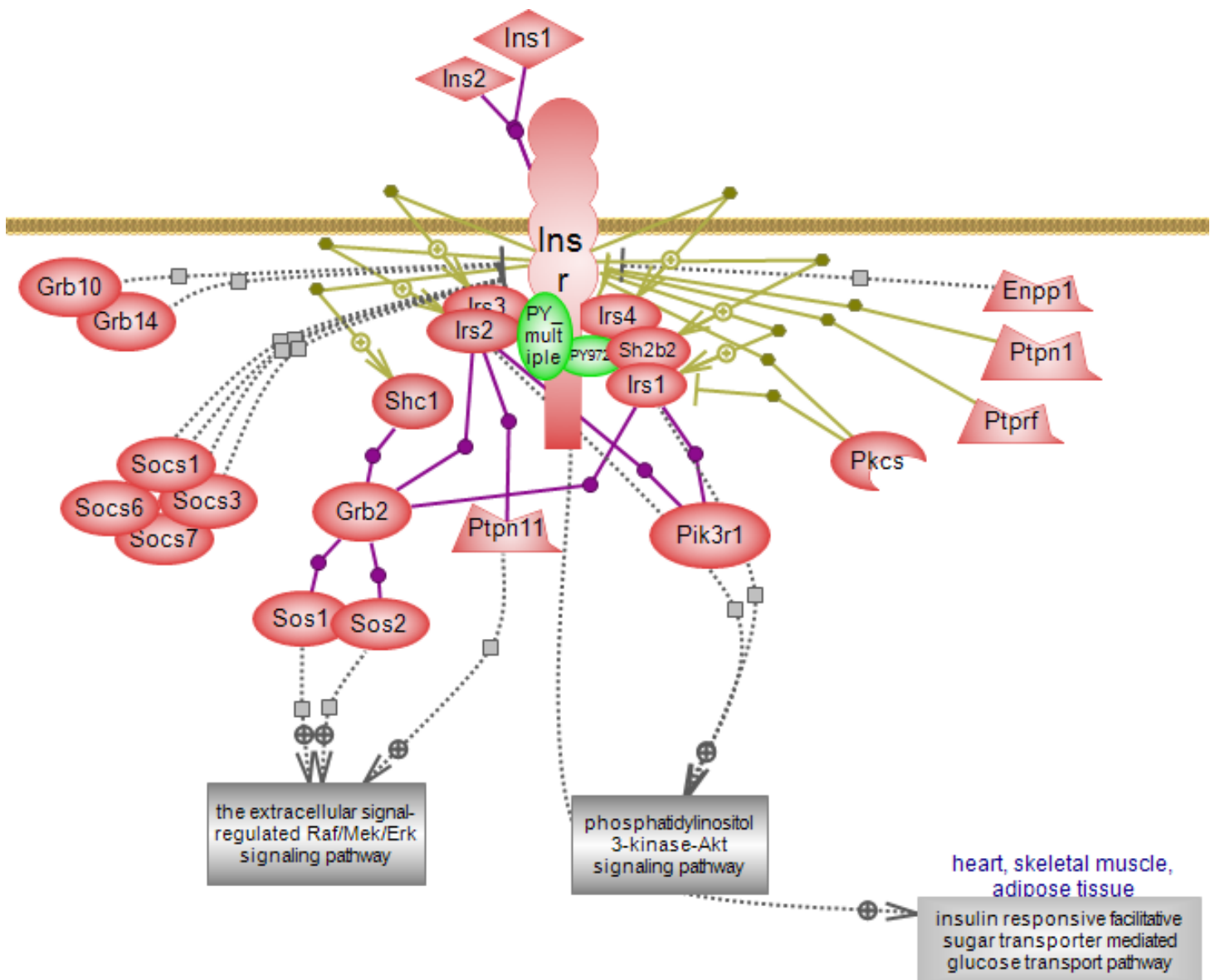
3. Describe in plain language how the ligand causes the cell process.

4. "*PKA also phosphorylates Pde4d, thus regulating its own activity*" Explain this mechanism.

5. A cancer patient is receiving an experimental treatment drug. Unfortunately, a major side effect is severe dehydration. Analyze which protein/gene in the pathway was likely being targeted and why the side effect occurred.

6. Identify 1 other signaling pathway that follows a similar pathway.

C. INSULIN SIGNALING PATHWAY



- Which of the following correctly describes this pathway?
 - A G-Protein membrane receptor, transduction, nuclear response
 - A Tyrosine Kinase membrane receptor, transduction, metabolic response
 - A G-Protein membrane receptor, transduction, metabolic response
 - A Tyrosine Kinase membrane receptor, transduction, nuclear response

2. What is the ligand for the receptor?

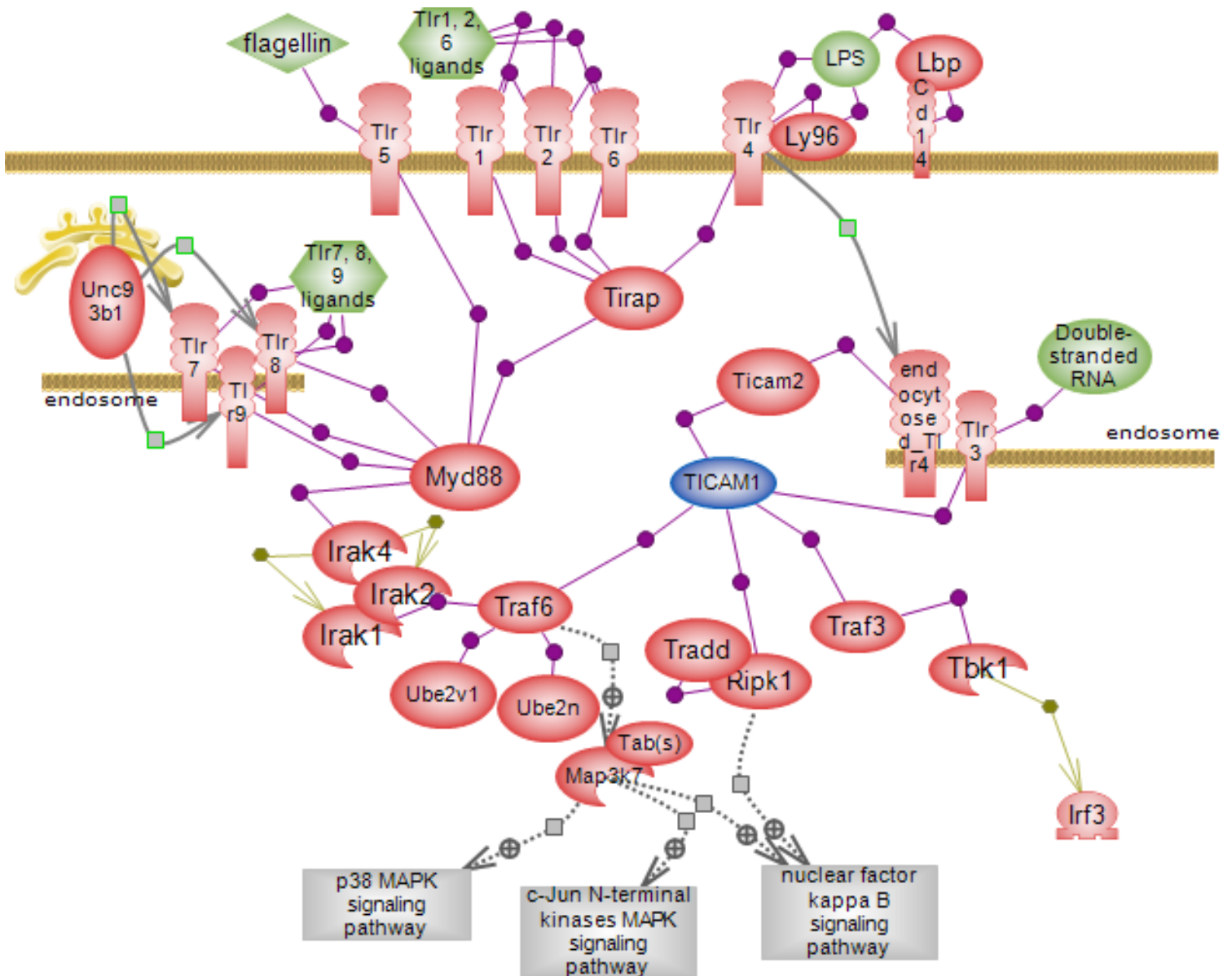
3. Explain the mechanism of action of this particular receptor type.

4. Contrast the **first** & **second** receptor responses in this example to those in Part B.

5. Some of the components in the pathway interact with the hormone estrogen (beta/alpha...estradiol are proper names for estrogens). For example, when you click on the image of Socs1 or the Ins r Receptor, under "INTERACTS WITH" you will see estrogen. Many studies have shown that type 2 diabetes sharply increases as estrogen levels drop off during menopause in women. Propose a logical "Interaction" that occurs between estrogen/Socs1 & estrogen/Ins r based on the diagram/text information.

6. Identify 1 other signaling pathway that follows a similar pathway.

D. TOLL-LIKE RECEPTOR SIGNALING PATHWAY



1. Which body system is this signaling pathway most closely associated with?

2. What are 4 examples of specific ligands and their sources?

3. For each statement below state whether it is true or false and **why**.

a. The Tlr's in this pathway are ideal for sensing antigens that mutate rapidly.

b. The Tlr's in this pathway are ideal for sensing a broad range of antigens.

c. The organisms that this pathway defends against are rare.

d. The Tlr's in this pathway have evolved in response to long periods of attack by similar antigens.

4. The virus **HPV** is able to remain in a host for the host's lifetime, causing prolonged relapses of symptoms despite this defense pathway. Interestingly, the cells sense the viral DNA and proteins and yet the virus persists. Propose 3 different mechanisms by which the virus hampers the signaling pathway.

Summary of Cell Signaling Pathways

1. Provide 5 points of similarity among the signaling pathways studied today. These can be similarities between a few or all of the pathways.

2. Provide 4 points of difference among the signaling pathways studied today. These can be differences between a few or all of the pathways.